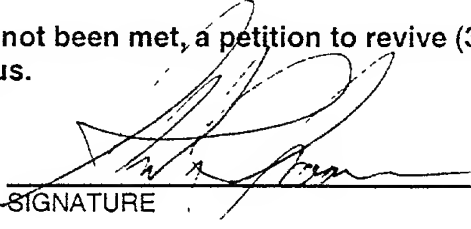


FORM PTO-1390 (REV 11-2000)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 124-926
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) 10/069461 Unknown
INTERNATIONAL APPLICATION NO. PCT/GB00/03072	INTERNATIONAL FILING DATE 09/08/2000	PRIORITY DATE CLAIMED 06/09/1999
TITLE OF INVENTION PRESSURE INDICATOR		
APPLICANT(S) FOR DO/EO/US TREEN, A. et al.		
<p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. <input checked="" type="checkbox"/> The U.S. has been elected by the expiration of 19 months from the priority date (Article 31). A copy of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). <input type="checkbox"/> has been communicated by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <input type="checkbox"/> is attached hereto. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). <input checked="" type="checkbox"/> have been communicated by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). <input type="checkbox"/> A English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). <p>Items 11 To 20 below concern document(s) or information included:</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. <input type="checkbox"/> A substitute specification. <input type="checkbox"/> A change of power of attorney and/or address letter. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). <input checked="" type="checkbox"/> Other items or information. PTO Form 1449 and 3 Cited References 		

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5) 10/069461		INTERNATIONAL APPLICATION NO. PCT/GB00/03072		ATTORNEY'S DOCKET NUMBER 124-926	
21. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5): -- Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO\$1040.00 -- International preliminary examination fee (37 C.F.R. 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO.....\$890.00 -- International preliminary examination fee (37 C.F.R. 1.482) not paid to USPTO but international search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO\$740.00 -- International preliminary examination fee (37 C.F.R. 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4).....\$710.00 -- International preliminary examination fee (37 C.F.R. 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4).....\$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$	890.00
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).				\$	0.00
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	18	-20 = 0	X \$18.00	\$	0.00
Independent Claims	1	-3 = 0	X \$84.00	\$	0.00
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			\$280.00	\$	0.00
CLAIM FEES ARE NOT BEING PAID AT THIS TIME				TOTAL OF ABOVE CALCULATIONS =	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.					0.00
SUBTOTAL =				\$	890.00
Processing fee of \$130.00, for furnishing the English Translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. 1.492(f)).					0.00
TOTAL NATIONAL FEE =				\$	890.00
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). \$40.00 per property				+	\$ 40.00
Fee for Petition to Revive Unintentionally Abandoned Application (\$1280.00 - Small Entity = \$640.00)				\$	0.00
TOTAL FEES ENCLOSED =				\$	930.00
				Amount to be:	
				refunded	\$
				Charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$930.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 14-1140 in the amount of \$_____ to cover the above fees. A duplicate copy of this form is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 14-1140. A duplicate copy of this form is enclosed. d. <input checked="" type="checkbox"/> The entire content of the foreign application(s), referred to in this application is/are hereby incorporated by reference in this application.					
NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: NIXON & VANDERHYE P.C. 1100 North Glebe Road, 8 th Floor Arlington, Virginia 22201-4714 Telephone: (703) 816-4000					
				 SIGNATURE	
				Stanley C. Spooner NAME	
				27,393 REGISTRATION NUMBER	
				February 26, 2002 Date	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

TREEN, A. et al.

Atty. Ref.: 124-926

Serial No. unknown

Group:

Filed: February 26, 2002

Examiner:

For: PRESSURE INDICATOR

* * * * *

February 26, 2002

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

PRELIMINARY AMENDMENT

In order to place the above-identified application in better condition for examination, please amend the application as follows:

IN THE SPECIFICATION

Please substitute the following paragraphs in the specification for corresponding paragraphs previously presented. A copy of the amended specification paragraphs showing current revisions is attached.

Page 1, before the first line, insert as a separate paragraph:

This application is the US national phase of international application PCT/GB03072 filed 9 August 2000, which designated the US.

IN THE CLAIMS

Please substitute the following amended claims for corresponding claims previously presented. A copy of the amended claims showing current revisions is attached.

5. A pressure indicator as claimed in claim 2 wherein the second surface is biased against the rigid structure.
7. A pressure indicator as claimed in claim 1 wherein the display diaphragm is transparent.
10. A pressure indicator as claimed in claim 1 wherein the recognisable configuration or pattern comprises a symbol or graphic projecting from the surface of the indicator diaphragm towards the display diaphragm.
13. A pressure indicator as claimed in claim 11 wherein the at least two components have different visibility.
14. A pressure indicator as claimed in claim 1 wherein either the display diaphragm or the indicator diaphragm comprises a flexible polymer.

15. An apparatus comprising a fluid reservoir and a pressure indicator according to claim 1 wherein one of the diaphragms is in fluid communication with the fluid reservoir.

17. A method of indicating fluidic or mechanical pressure using a pressure indicator according to claim 1.

18. A ball comprising a pressure indicator as claimed in claim 1.

TREEN, A. et al.
Serial No. unknown

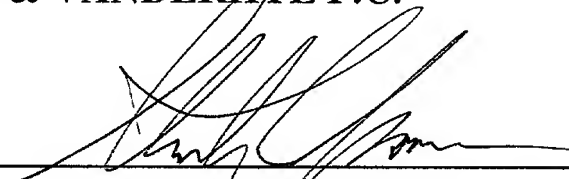
REMARKS

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page(s) is captioned "**Version With Markings To Show Changes Made.**"

Respectfully submitted,

NIXON & VANDERHYTE P.C.

By: _____


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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Page 1, before the first line, insert as a separate paragraph:

This application is the US national phase of international application
PCT/GB03072 filed 9 August 2000, which designated the US.

IN THE CLAIMS

5. A pressure indicator as claimed in ~~any of claims 2 to 4~~ wherein the second surface is biased against the rigid structure.

7. A pressure indicator as claimed in ~~any preceding claim 1~~ wherein the display diaphragm is transparent.

10. A pressure indicator as claimed in ~~any preceding claim 1~~ wherein the recognisable configuration or pattern comprises a symbol or graphic projecting from the surface of the indicator diaphragm towards the display diaphragm.

13. A pressure indicator as claimed in claim 11 ~~or claim 12~~ wherein the at least two components have different visibility.

14. A pressure indicator as claimed in ~~any preceding claim 1~~ wherein either the display diaphragm or the indicator diaphragm comprises a flexible polymer.

15. An apparatus comprising a fluid reservoir and a pressure indicator according to ~~any preceding claim 1~~ wherein one of the diaphragms is in fluid communication with the fluid reservoir.

17. A method of indicating fluidic or mechanical pressure using a pressure indicator according to ~~any of the preceding claims 1~~.

18. A ball comprising a pressure indicator as claimed in ~~any preceding claim 1~~.

PRESSURE INDICATOR

This invention relates to a pressure indicator.

According to a first aspect of the present invention, a pressure indicator comprises a display diaphragm and an indicator diaphragm coupled to and in fluid communication with the display diaphragm and forming a compartment with the display diaphragm; wherein, in use, a change in pressure applied to the diaphragms causes relative movement between the diaphragms which is observable either on the outer surface of the display diaphragm or through the display diaphragm. To see through the display diaphragm effectively, it is preferably transparent.

10. Preferably, a means to amplify the movement between the diaphragms caused by the change in pressure applied to the diaphragms is provided. This would enable small changes in applied pressure to be observable. The means to amplify the movement between the diaphragms may comprise an article having a first surface and a second surface, the second surface having a larger cross sectional area than the first surface, the first surface being in fluid communication with one of the diaphragms. A change in pressure applied to the second surface causes an amplified movement of the first surface which is communicated to the diaphragms. Preferably, the first surface of the article is the indicator diaphragm.

20. Preferably, the means to amplify the change in pressure applied to the diaphragms is biased so that on removal of the change in pressure applied, the means to amplify the change in pressure returns to its original position i.e. that prior to the application of the pressure. This ensures that an accurate indication of the pressure is obtained. The biasing means may be a spring or elastomeric material.

25. In a preferred embodiment, the diaphragms form a compartment and contain a liquid or gel which may be at least partially opaque. The compartment may be sealed, alternatively the diaphragms may be in mechanical communication without being sealed.

30. In another preferred embodiment, the indicator diaphragm bears a recognisable configuration or pattern such that the configuration or pattern is observable either on the outer surface of the display diaphragm or through the display diaphragm thereby

aiding observation of the relative movement. The recognisable configuration or pattern may comprise a symbol or graphic projecting from the surface of the indicator diaphragm. This facilitates observation on the outer surface of the display diaphragm if the symbol or graphic either abuts the inner surface of the display diaphragm or protrudes through the display diaphragm.

Alternatively, either the display diaphragm or, if present, the liquid or gel may be partially opaque. Upon relative movement between the diaphragms, the symbol or graphic which projects from the surface of the indicator diaphragm either appears or disappears or, alternatively, becomes more or less visible when viewed through the display diaphragm.

In order to indicate a range of pressure, it is necessary to define the two extremes of that range, i.e. a high pressure extreme and a low pressure extreme. Thus, it is preferable that the configuration or pattern comprises at least two components, each component corresponding to a different pressure.

Such components may project from the surface of the indicator diaphragm by different amounts, thereby abutting the display diaphragm at different pressures. Alternatively, the components may have different visibility such that they can become visible and invisible at different pressures, e.g. by having different colours or symbols and patterns.

The relative movement of the diaphragms may be accommodated where either diaphragm comprises a flexible polymer and especially an elastomer. The symbol or graphic may also comprise a flexible polymer or elastomer.

Where the indicator diaphragm is subjected to a higher pressure than the display diaphragm, it is preferable that the indicator diaphragm is impermeable so as to prevent leakage.

According to a second aspect of the present invention, apparatus comprises a fluid reservoir and a pressure indicator according to any preceding claim wherein one of the diaphragms is in fluid communication with the fluid reservoir. The apparatus may be an inflatable such as a tyre or a ball.

The pressure indicator may be incorporated in the surface of the fluid reservoir or, more conveniently housed in or around a valve assembly.

According to a third aspect of the present invention, a method of indicating either fluidic or mechanical pressure comprises the steps of applying a pressure to a pressure indicator, the indicator comprising a display diaphragm and an indicator diaphragm coupled to and in fluid communication with the display diaphragm; and observing the relative movement between the diaphragms caused by the pressure applied, either on the outer surface of the display diaphragm or through the display diaphragm.

- 10 Preferably, the indicator diaphragm bears a recognisable configuration or pattern such that the relative movement is observed either when the pattern or configuration abuts the display diaphragm, or when the pattern or configuration becomes visible through the display diaphragm.

- 15 In a preferred method, the pattern or configuration may comprise a symbol or graphic having at least two components where each component corresponding to a different pressure. This enables a pressure range to be defined whereby one of the components defines a lower relative pressure, the other a higher relative pressure.

The invention will now be described, by way of example only, with reference to the figures in which:

- 20 Figure 1 shows, schematically, a football having a pressure indicator according to the present invention;

Figure 2a shows a cross-section of the pressure indicator of figure 1 when the football is under inflated;

- 25 Figure 2b shows the indication visible on the pressure indicator of figure 1 when the football is under inflated;

Figure 2c shows a cross-section of the pressure indicator of figure 1 when the football is correctly inflated;

Figure 2d shows the indication visible on the pressure indicator of figure 1 when the football is correctly inflated;

Figure 2e shows a cross-section of the pressure indicator of figure 1 when the football is over inflated;

Figure 2f shows the indication visible on the pressure indicator of figure 1 when the football is over inflated; and

5 Figures 3a and 3b show, schematically, a valve having a pressure indicator according to the present invention.

Figure 3c shows a valve assembly suitable for use in a valve described in Figures 3a and 3b.

Figures 4a and 4b show a display diaphragm according to the present invention.

Figure 4c shows an indicator diaphragm according to the present invention.

Figure 5 shows a pressure indicator according to the present invention.

Figure 6 shows a pressure indicator according to the present invention.

Figure 7 shows a pressure indicator according to the present invention.

15 Figure 8 shows a means to amplify the applied pressure according to the present invention.

Figure 1 shows, schematically, a football 1 having a pressure indicator 2 according to the present invention. A valve 3 is positioned in the wall of the football, whereby, using conventional methods, the football can be inflated through the valve, e.g. by
20 using a pump (not shown). The pressure indicator is exposed to both the internal pressure of the football and atmospheric pressure outside the football. It will be appreciated that there is an optimal range in which a football should be pressurised for bounce and control. Below this range, the football can be said to be under inflated and above, it can be said to be over inflated.

25 Figure 2a shows a cross-section of the pressure indicator 2 when the football 1 is under inflated. The pressure indicator comprises a transparent display diaphragm 4 coupled to and in fluid communication with an indicator diaphragm 5. The diaphragms form a compartment 6. The surface of the indicator diaphragm has projecting therefrom a diamond symbol 7 and a cross symbol 8 where the diamond symbol
30 projects further from the indicator diaphragm than the cross symbol. An opaque gel

fills the remainder of the compartment. An example of a suitable gel is a silicone rubber although a person skilled in the art will be aware of other suitable materials.

Figure 2b (not to scale) shows the indication visible through the display diaphragm 4 of the pressure indicator 2 when the football 1 is under inflated. When under inflated, neither the diamond 7 or the cross 8 are visible through the display diaphragm 4 due to the opaqueness of the gel contained in the compartment i.e. they do not contact the indicator diaphragm.

Figure 2c shows a cross-section of the pressure indicator 2 when the football 1 is correctly inflated. Pressure is exerted on the indicator diaphragm 5 which is sufficient to cause the indicator diaphragm to depress, thereby allowing the diamond 7 (but not the cross 8) to abut the display diaphragm 4. When the diamond abuts the display diaphragm, the opaque gel is displaced such that the diamond becomes visible when viewed through the display diaphragm as shown in figure 2d (not to scale).

Figure 2e shows a cross-section of the pressure indicator of figure 1 when the football 1 is over inflated. The pressure exerted on the indicator diaphragm is greater than that as shown in figure 2c resulting in greater relative movement between the diaphragms. As such, both the diamond and the cross abut the display diaphragm and thus become visible when viewed through the display diaphragm as shown in figure 2f (not to scale).

Figure 3a shows, schematically, a valve 9 having a pressure indicator 10 according to the present invention. In use, the valve is connected to an inflatable or inflated object 11. The indicator assembly 12 is positioned within the transparent valve casing 13 so as to be visible when viewed from above. The indicator assembly may also be viewed from the side. The pressure indicator is exposed to atmospheric pressure and also the internal pressure of the object via the pressure equalisation channel 14.

The indicator assembly comprises a display diaphragm 122 which is responsive to changes in pressure via the pressure equalisation channel 14. The display diaphragm 122, on an increase in pressure, presses against the indicator diaphragm 121. The indicator diaphragm 121 may be made from a lenticular material such as is described in figure 4. When the correct pressure is communicated to the display

diaphragm 122 via the pressure equalisation channel 14, the display is revealed. The display diaphragm 122 is annular in shape.

Figure 3b shows, schematically, a valve 15 having a pressure indicator 16 according to the present invention. In use, the valve is connected to an inflatable or inflated object 17. The indicator assembly 18 is positioned within the transparent valve casing 19 which acts as a guide to light entering the casing so the indication is visible when viewed from above. The indicator assembly may also be viewed from the side. The pressure indicator is exposed to both the internal pressure of the object and atmospheric pressure.

Figure 4a shows a display diaphragm having a lenticular shape, 20. The diaphragm is manufactured by casting an elastomer, for example polydimethoxy siloxane (PDMS) in a master mould. The display surface is viewed from side A and when in an uncompressed state (as shown) the diaphragm appears silvery, as a result of the diffractive and reflective properties of the lenticular shape.

When a pressure is applied to the indicator diaphragm, it contacts the peaks of the display diaphragm from side B. As the pressure is increased, the display diaphragm compresses the lenticular shape, changing the diffractive and reflective properties of the indicator diaphragm. At a certain amount of compression, depending on the end use of the pressure indicator, the display surface becomes transparent revealing the image on the indicator diaphragm.

Figure 4b shows a display diaphragm comprising three layers of lenticular material, 20. By using a layered structure, the amount of reflected light, when the diaphragm is uncompressed, is increased.

Figure 4c shows an indicator diaphragm comprising lenticular material 20. In this example, the lenticular material is rolled up and inserted in a tube (the display diaphragm, not shown). The triangles may face inwardly or outwardly. In this case they face outwardly. One layer of the lenticular material may be used or, the indicator diaphragm may comprise a number of layers which can be made by creating a spiral of the indicator diaphragm prior to insertion into the tube. This example is particularly suitable for use in tyre valves.

Figure 5 shows a tapered tube of elastomeric material having a frosted outer surface, 21. The frosted surface is produced by grit blasting the surface of mould in which the tube is formed. The tube is placed between the display diaphragm, 22 and the indicator diaphragm, 23. When compressed, the tube becomes transparent. As the tube is tapered, the end of the tube having the largest diameter is compressed first so, the whole indicator diaphragm is revealed only when the whole tube is compressed i.e. when the applied pressure is sufficient to compress the end of the tube having the smallest diameter. This example is useful when there are upper and lower limits of acceptable pressure within a body in fluid communication with the indicator diaphragm.

Figure 6 shows that the tapered tube of Figure 5 may be substituted with a tapered triangular elastomeric tube 24. Small sections of the tube may be removed providing a space between sections of the indicator diaphragm. This could be used to provide a clearer indication of the transition between for example too low a pressure and a pressure within acceptable limits.

Figure 7 shows an indicator diaphragm, 25 having projections, 26 of an elastomeric material. The projections are of graduated height. As the applied pressure to the indicator diaphragm is increased, 27 the projections press in turn against the display diaphragm, 28 producing first one dot and then a series of dots.

Figure 8 shows a means for amplifying the pressure applied to the indicator diaphragm. A display diaphragm, 30 has a transparent region within it, 31. The indicator diaphragm, 32 is housed within a rigid plastic cup, 33 which is sealed to the display diaphragm and impermeable. Within the cup is a first circular surface, 34 in communication with a second larger circular surface, 35 via a rod, 36 which passes through the cup. The application of pressure to the second surface forces it down towards the cup. The force acting on the second surface is transmitted by the rod to the first surface and amplified by virtue of the different cross sectional or surface areas of the two surfaces. The amplification of the pressure depends on the ratio between the surface area of the two surfaces. The first surface will, at a predetermined pressure, contact the indicator diaphragm which becomes observable through the display diaphragm. A biasing means, 37 which in this case is an elastomeric foam block but, may be a spring, is placed between the second surface

and the cup. When the applied pressure is removed, this foam forces the second surface back to its starting position.

ART 34 AMDT

8

CLAIMS

1. A pressure indicator comprising
a display diaphragm, and
an indicator diaphragm bearing a recognisable configuration or pattern coupled to and in fluid communication with the display diaphragm and forming a compartment with the display diaphragm, wherein, in use, a change in pressure applied to the indicator causes relative movement between the diaphragms which is observable either when the pattern or configuration abuts the display diaphragm, or when the pattern or configuration becomes visible through the display diaphragm.
2. A pressure indicator as claimed in claim 1 further comprising a means to amplify the relative movement between the diaphragms which results from the change in pressure.
3. A pressure indicator as claimed in claim 2 wherein the means to amplify the change in pressure comprises
an article having a first surface and a second surface, the second surface having a larger cross sectional area than the first surface;
wherein the first surface is in fluid communication with one of the diaphragms and in use, a change in pressure applied to the second surface causes an amplified movement of the first surface.
4. A pressure indicator as claimed in claim 3 wherein the first surface comprises the indicator diaphragm.
5. A pressure indicator as claimed in any of claims 2 to 4 wherein the second surface is biased against the rigid structure.
6. A pressure indicator as claimed in claim 5 wherein the biasing means comprises a spring or elastomeric material.
7. A pressure indicator as claimed in any preceding claim wherein the display diaphragm is transparent.

8. A pressure indicator as claimed in claim 1 wherein the compartment contains a liquid or gel.
9. A pressure indicator as claimed in claim 8 wherein the liquid or gel is partially or fully opaque.
10. A pressure indicator as claimed in any preceding claim wherein the recognisable configuration or pattern comprises a symbol or graphic projecting from the surface of the indicator diaphragm towards the display diaphragm.
11. A pressure indicator as claimed in claim 11 wherein the configuration or pattern comprises at least two components, each component contacting the display diaphragm at different pressures.
12. A pressure indicator as claimed in claim 11 wherein the at least two components have different colours.
13. A pressure indicator as claimed in claim 11 or claim 12 wherein the at least two components have different visibility.
14. A pressure indicator as claimed in any preceding claim wherein either the display diaphragm or the indicator diaphragm comprises a flexible polymer.
15. An apparatus comprising a fluid reservoir and a pressure indicator according to any preceding claim wherein one of the diaphragms is in fluid communication with the fluid reservoir.
16. An apparatus according to claim 15 wherein the apparatus is an inflatable.
17. A method of indicating fluidic or mechanical pressure using a pressure indicator according to any of the preceding claims.
18. A ball comprising a pressure indicator as claimed in any preceding claim.

(19) World Intellectual Property Organization
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(81) Designated States (*national*): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

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Published:

— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **PRESSURE INDICATOR**

(57) Abstract: A pressure indicator and a corresponding method are disclosed, the pressure indicator comprising a display diaphragm, optionally transparent, and an indicator diaphragm coupled to and in fluid communication with the display diaphragm. In use, pressure is applied to the diaphragms, which may be amplified, whereby a change in the pressure applied causes relative movement between the diaphragms which is observable either on the outer surface of the display diaphragm or through the display diaphragm. The diaphragms may form a compartment preferably containing a liquid or gel. The indicator diaphragm may bear a recognisable configuration or pattern which can be coloured and may comprise a symbol or graphic projecting from its surface. The configuration or pattern may comprise at least two components, each component corresponding to a different pressure. Also disclosed is an inflatable device, especially a football or a tyre, comprising such a pressure indicator.

WO 01/18517 A1

Fig.1.

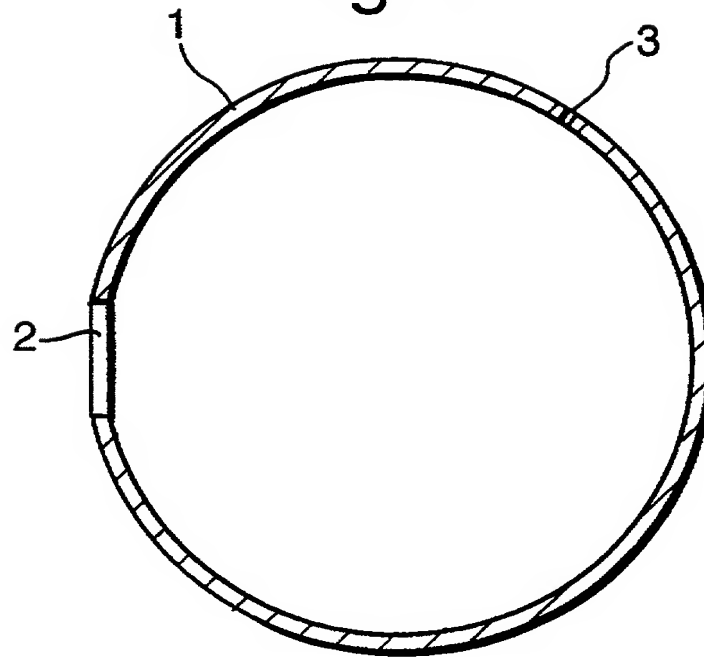


Fig.8.

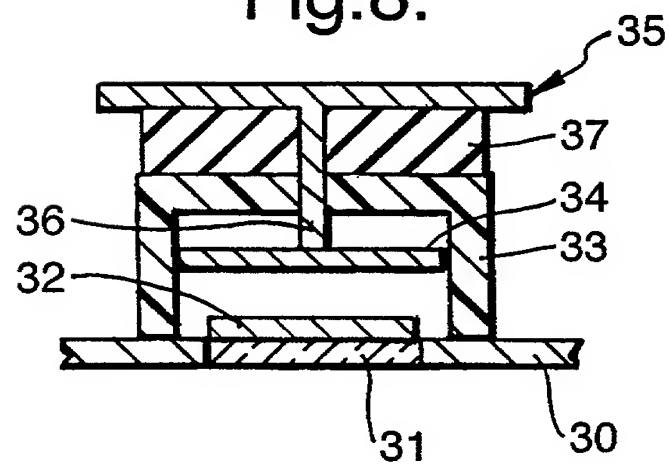


Fig.2a.

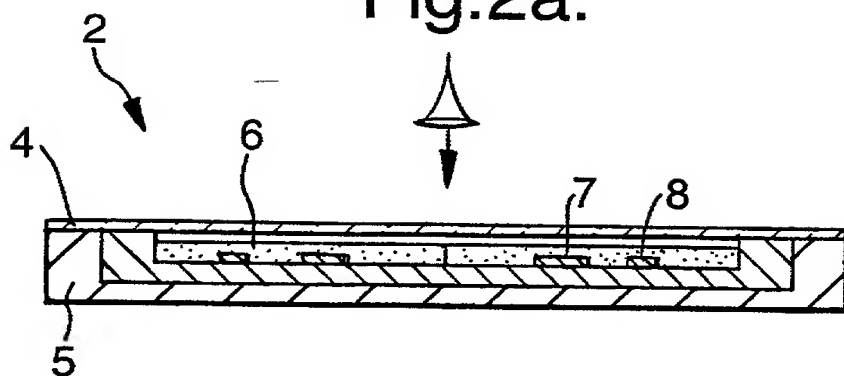


Fig.2b.

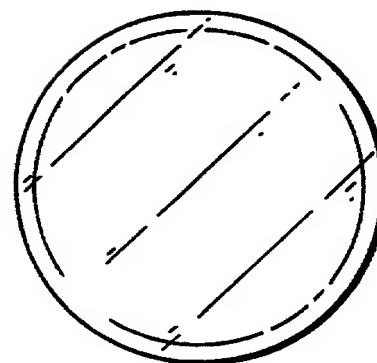


Fig.2c.

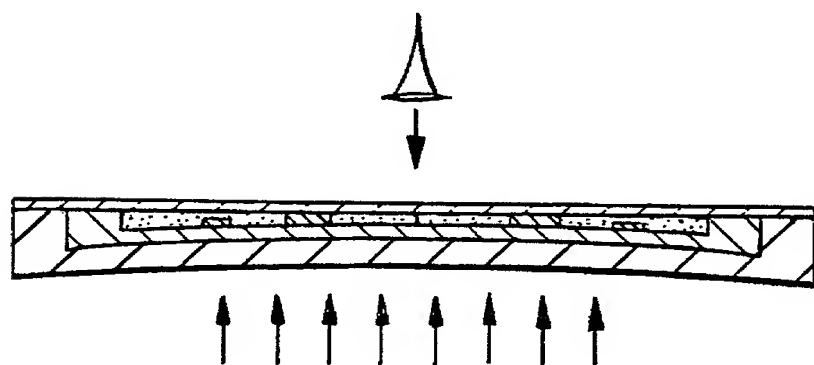


Fig.2d.

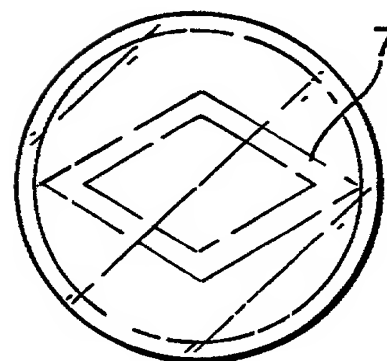


Fig.2d.

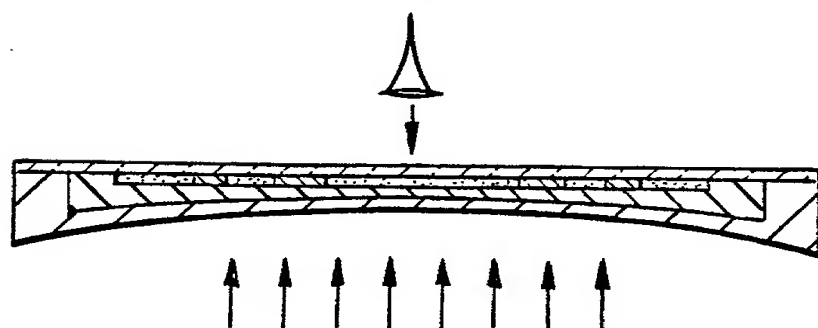
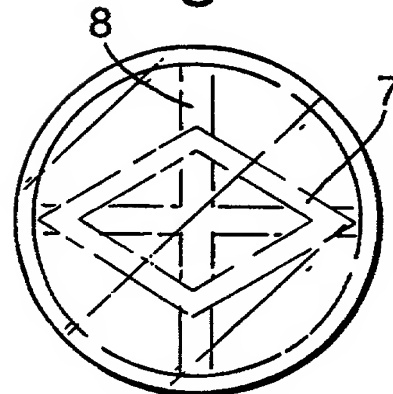


Fig.2f.



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Fig.3a.

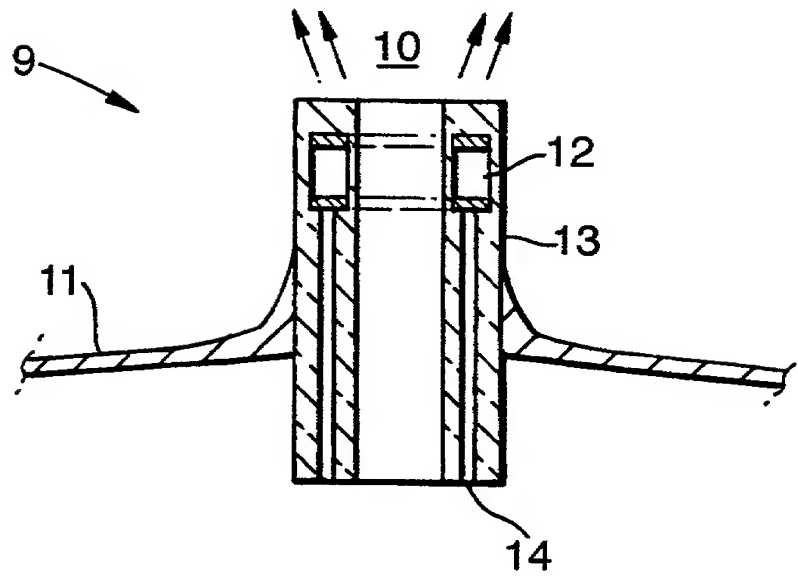


Fig.3b.

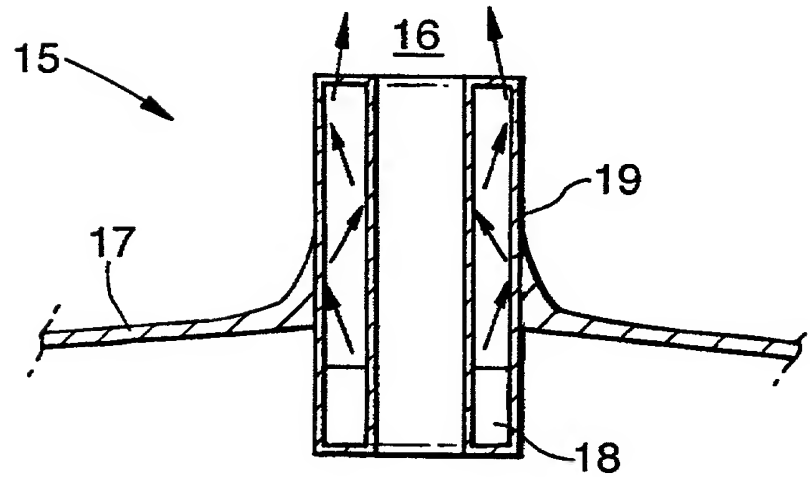


Fig.3c.

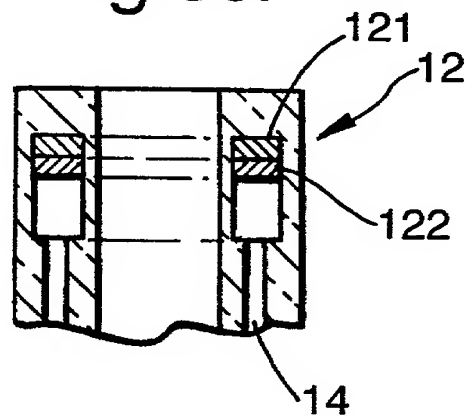


Fig.4a.

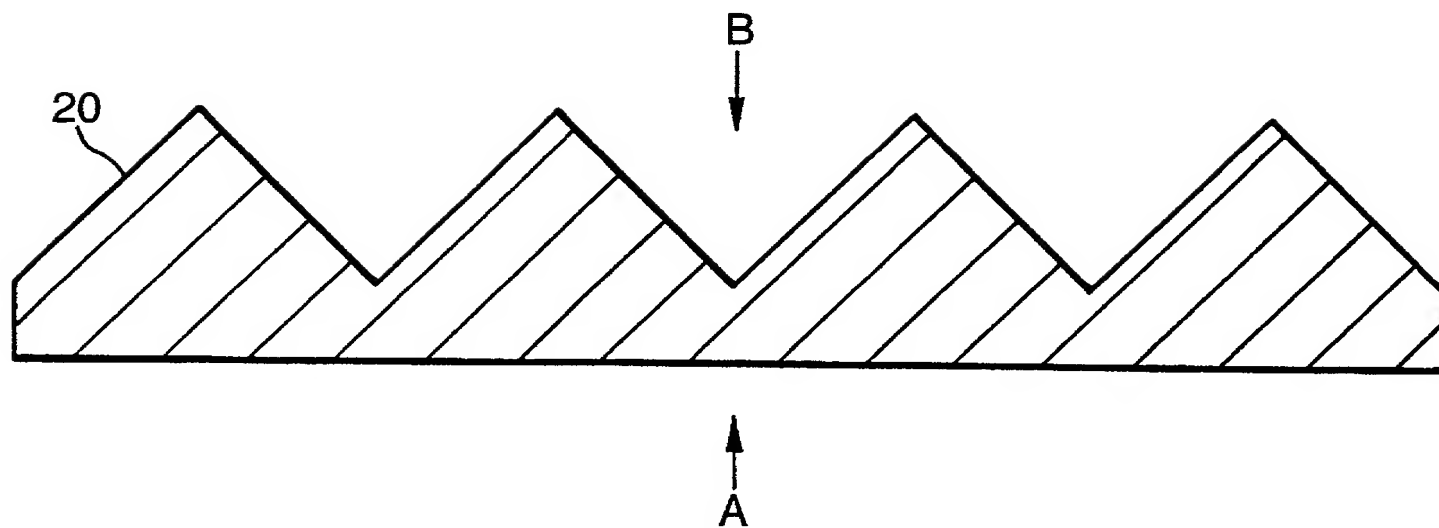


Fig.4b.

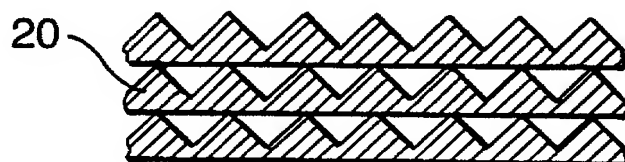


Fig.4c.

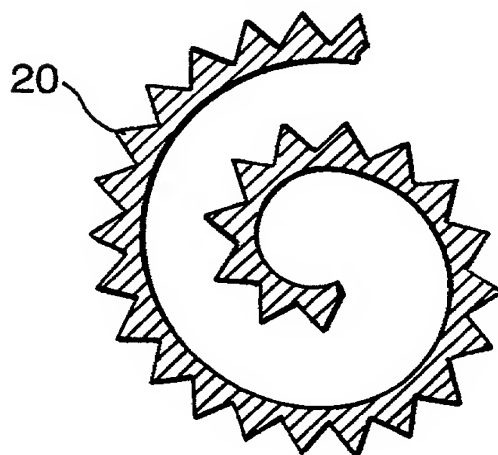


Fig.5.

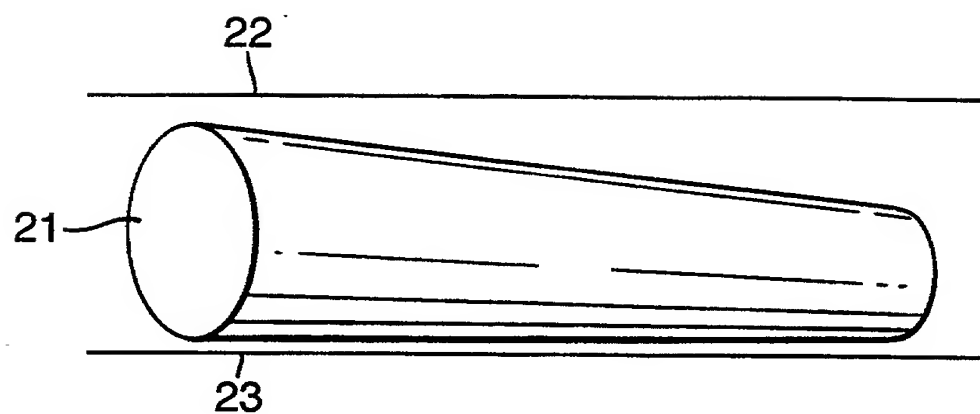


Fig.6.

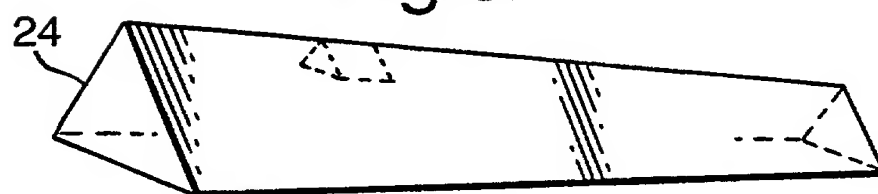
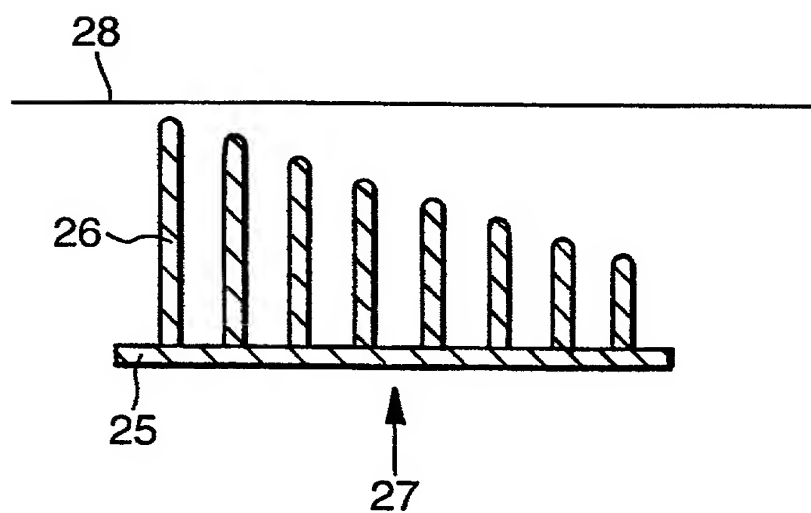


Fig.7.



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As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PRESSURE INDICATOR

the specification of which (check applicable box(es)):

☐ is attached hereto

☐ was filed on _____

☒ was filed as PCT International application No. _____

as U.S. Application Serial No. _____

Atty Dkt. No. P2755/USW

PCT/GB00/03072

on 09-Aug-2000

and (if applicable to U.S. or PCT application) was amended on 26/10/2001

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 C.F.R. 1.56. I hereby claim foreign priority benefits under 35 U.S.C. 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed or, if no priority is claimed, before the filing date of this application:

Priority Foreign Application(s):

Application Number

Country

Day/Month/Year Filed

9920885.2

GB

06-Sep-199

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

Application Number

Date/Month/Year Filed

I hereby claim the benefit under 35 U.S.C. 120/365 of all prior United States and PCT international applications listed above or below and, insofar as the subject matter of each of the claims of this application is not disclosed in such prior applications in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose material information as defined in 37 C.F.R. 1.56 which occurred between the filing date of the prior applications and the national or PCT international filing date of this application:

Prior U.S./PCT Application(s):

Application Serial No.

Day/Month/Year Filed

Status: patente
pending, abandone

PCT/GB00/03072

09-Aug-2000

PENDIN

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon. And I hereby appoint **NIXON & VANDERHYE P.C., 1100 North Glebe Rd., 8th Floor, Arlington, VA 22201-4714, telephone number (703) 816-4000 (to whom all communications are to be directed)**, and the following attorneys thereof (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent: Arthur R. Crawford, 25327; Larry S. Nixon, 25640; Robert A. Vanderhye, 27076; James T. Hosmer 30184; Robert W. Faris, 31352; Richard G. Besha, 22770; Mark E. Nusbaum, 32348; Michael J. Keenan, 32106; Bryan H. Davidson, 30251; Stanley C. Spooner, 27393; Leonard C. Mitchard, 29009; Duane M. Byers, 33363; Jeffry H. Nelson, 30481; John R. Lastova, 33149; H. Warren Burnam, Jr. 29366; Thomas E. Byrne, 32205; Mary J. Wilson, 32955; J. Scott Davidson, 33489; Alan M. Kagen, 36178; William J. Griffin, 31260; Robert A. Molan, 29834; B. J. Sadoff, 36663; James D. Berquist, 34776; Updeep S. Gill, 37334; Michael J. Shea, 34725; Donald L. Jackson, 41090; Michelle N. Lester, 32331.*

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Page 2

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the specification of which (check applicable box(es)):

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☒ was filed as PCT International application No. PCT/GB00/03072 on 09-Aug-2000

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